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Quality Assessment of Broiler Day-old Chicks Supplied to Maiduguri, North-Eastern Nigeria

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Abstract: Chick quality assessment was carried out on day-old chicks supplied to Maiduguri. A total of 30 broiler day-old chicks, comprising of 10 chicks each from three major suppliers were used for this study. The chicks were separately grouped according to sources, randomly designated as A, B and C. Physical, microbiological and serological qualities were assessed. Chicks from source B were found to have significantly ($P < 0.05$) higher mean body weight (33.8 ± 1.21 g) than chicks from sources A and C. Similarly, source B chicks had higher mean chick length (18.86 ± 0.21 cm) than chicks from other sources. Microbiological assessment revealed *E. coli* and *Staphylococcus spp.* as the common bacteria encountered from the navels and cloacal swabs, while *Proteus spp.* and *Streptococcus spp.* were only isolated from the navel and cloacal swabs of chicks from sources A and C respectively. Thirty percent of chicks from source C and 10% of chicks from source B were found with antibodies against infectious bursal disease (IBD). Similarly, 80%, 75% and 44.4% of chicks from sources B, C and A were found to have antibodies against Newcastle disease (ND) respectively. Source B was found to supply day-old chicks of better quality to Maiduguri. Minimum standards are suggested to be set for physical, microbiological and serological qualities and a regulatory body should also be established to ensure strict adherence to the minimum standards of day-old chicks quality supplied to farmers in Nigeria.

Key words: Quality assessment, broiler, day-old chicks, Maiduguri, Nigeria

Introduction

Poultry production is one of the most important sectors of Nigeria's economy that has experienced significant growth within the last two decades. Between 1990 and 2003 egg production increased from 337,000 tonnes to 548,000 tonnes. Poultry meat production also increased from 57,000 tonnes to 121,000 tonnes, indicating 112 percent increase over a period of 14 years which clearly shows the prime importance of poultry production both as a source of protein and enterprise for employment/income generation (Alimi *et al.*, 2006). In spite of these obvious potentials, poultry production is still bedeviled with a number of constraints which include low income, small scale of operation of most practitioners, poor management, high mortality rate and poor chick quality (Adesimi and Awoyomi, 1989; Bamire and Ayanwale, 1995; Aihonsu and Sunmola, 1999; Alimi, 2001; Geidam *et al.*, 2006).

Day-old chicks are the end product of the hatchery industry, and form an important input for the farmer who requires chicks with good feed conversion efficiency and low mortality (Tona *et al.*, 2005). For economic reasons, the major objective of a hatchery is to obtain a high hatchability (large numbers of marketable chicks) while the farmers need chicks of high growth performance. However, good hatchability does not necessarily positively correlate with high percentage of chicks of good quality, and maximal hatchability is not the best indicator for the highest post-hatch viability and growth

(Decuypere and Michels, 1992; Borzemska *et al.*, 1998). Until recently, day-old chick quality had received little attention, as there has been no universally established method for its measurement. Several studies have reported the effects that the quality of the chick may have on the early growth performance of broilers and growth to slaughter weight. The day-old chick quality therefore provides some important information about the quality of the hatching eggs, the adequacy of the incubation method and can predict the potential growth performance of the broiler to slaughter age (Hill, 2001; Deeming, 2000; Boerjan, 2002; Decuypere *et al.*, 2002; Tona *et al.*, 2003). Parameters that can be used in assessing the performance potentials of chicks using quantitative and qualitative measurements have been reviewed (Tona *et al.*, 2005; Geidam *et al.*, 2006). This study examined the quality of broiler day-old-chicks supplied to Maiduguri, North Eastern Nigeria.

Materials and Methods

Study area: Maiduguri is the capital and the largest urban centre of Borno State. The State lies between latitude $11^{\circ}32'$ north and $11^{\circ}40'$ north and longitude $13^{\circ}20'$ East and $13^{\circ}25'$ East; and located between the Sudan savannah and sahel savannah vegetation zones, characterized by short rainy season of 3-4 months (June-September) followed by a prolonged dry season of more than 8 months duration (Ibrahim *et al.*, 2006).
Experimental birds and procedure: The study involved 30

broiler day-old-chicks, 10 chicks each from the three main suppliers of day-old-chicks in Maiduguri (El-Ibrahim Enterprises, Tanya Agrovvet Services and Vetagric Ltd.), all of whom are accredited agents to identified different major hatcheries in Nigeria. Random sampling was used in selecting 10 boxes and selecting a chick from each box of a batch supplied. The chicks collected from the different agents were separately grouped and randomly designated as source A, B and C.

The quality of the day-old chicks from the sources A, B and C were assessed using 3 different quantitative and qualitative parameters; physical assessment, microbiological and serological qualities. These procedures were performed as described by Tona *et al.* (2005) and Geidam *et al.* (2006).

Physical quality: The chicks were assessed for physical qualities based on the following parameters; chick weight, chick length, 7 day mortality, navel closure, physical deformity and time taken for chick to stand on its feet when placed on its back (agility). The body weight of the chicks in grams (g) was measured on day one using a sensitive beam balance (Mettler®, CH-8606). Chick length was taken by measuring the length of stretched chick from the tip of the beak to the middle toe using a measuring tape and recorded in centimeters (cm). Physical deformities like deformed legs, underdeveloped feathers, weak legs, soundness of eyes and overall appearance was examined for all the chicks and recorded for all the sources. The navel of each chick from all sources was examined for closure. Time taken for chick to stand on its feet when placed on its back as a measure for agility or vitality was recorded in seconds for each chick from all sources. On the seventh day the number of chicks that died (7th day mortality profile) from each source was recorded.

Microbiological assessment: Microbiological assessment was done by the examination of cloacal and navel swabs for presence of pathogenic bacteria. On day 3, samples of cloaca and navel swabs were collected from each chick for bacteria isolation on selective differential media. MacConkey agar was used to check for presence coli form bacteria and blood agar for enteric bacteria. Gram staining was done to identify the Gram positive and Gram negative bacteria from the bacteria isolated on different culture media. Eosin methylene blue (EMB) was used to confirm the presence of *Escherichia Coli*. The slides were viewed under Microscope using X 100 magnification or oil immersion. Gram positive and negative bacteria were identified. All media were prepared according to manufacturers instructions.

Serological quality: Presence of antibodies against Newcastle disease and infectious bursal disease, the

two most important endemic viral diseases in Nigeria, was used in the assessment of serological quality. On day 7, blood samples were collected from each chick through the wing vein using tuberculin syringe and needle into sterile containers and allowed to clot at room temperature. Sera were then harvested by centrifuging the tubes at 1,500 rpm for 10 minutes. The samples were stored in sterile bottles at 20°C until tested. Haemagglutination test and haemagglutination inhibition test were used to detect for antibodies against Newcastle disease virus as described by Allan and Gough (1974). While agar gel precipitation test was used to identify the presence of antibodies against infectious bursal disease virus following standard procedure as described by Cullen and Wyeth (1975).

Statistical Analysis: The data obtained were analyzed using t-test (GraphPad Instat, 1998).

Results

Results of the physical, microbiological and serological quality assessment of broiler day-old-chicks from the 3 different sources are presented in Table 1, 2 and 3 respectively. The mean body weight of chicks from source B were significantly ($P < 0.05$) higher than chicks from sources A and C. Similarly source B chicks showed higher mean chick length values than the chicks from the other sources. However, the difference in the mean chick length between the groups was not statistically significant ($P > 0.05$). Similarly, there was no significant ($P > 0.05$) difference in chick agility between the groups. All the chicks (100%) from source B had their navels completely closed while only 70% of chicks from source C and 60% from source A had their navels closed. 10% mortality was recorded from all the sources in the first 7-days. None of the three sources had chicks with physical deformity.

In the microbiological assessment a total of 4 different bacterial organisms (*E. coli*, *Streptococcus spp.*, *Staphylococcus spp.* and *Proteus spp.*) were isolated from the cloacal and navel swabs of chicks from the different sources. *E. coli* and *Staphylococcus spp.* were the most common bacteria encountered from the navel and cloaca of all the chicks from the different sources. *Streptococcus spp.* was only isolated from the navel and cloaca of chicks from source C. *Proteus spp.* was isolated from cloaca of chicks from source A and the navel of chicks from source C.

A highest value of 30% of the chicks from source C tested positive for antibodies against infectious bursal disease followed by 10% of chicks from source B. None of the chicks from source A tested positive for antibodies against IBD. 80% of the chicks from source B tested positive for antibodies against ND, 75% by chicks from source C and only 44.4% of chicks from source A tested positive for antibodies against ND.

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Table 1: Physical quality of chicks supplied to Maiduguri, north eastern Nigeria

Parameters	Source		
	A	B	C
Chick weight (g) (Mean±SEM)	29.5±0.54	33.8±1.21	29.7±0.70
Chick length (cm) (Mean±SEM)	18.35±0.27	18.86±0.211	8.56±0.26
Vitality timing (s) (Mean±SEM)	0.70±0.05	0.65±0.13	0.95±0.21
Navel closure (%)	60	100	70
Physical deformities (%)	0	0	0
Seven day mortality (%)	10	10	10

Table 2: Bacteriological quality of chicks supplied to Maiduguri, north eastern Nigeria

Bacterial isolates	Source					
	A		B		C	
	Navel	Cloaca	Navel	Cloaca	Navel	Cloaca
<i>Escherichia coli</i>	+	+	+	+	+	+
<i>Streptococci species</i>	-	-	-	-	+	+
<i>Staphylococci species</i>	+	+	+	+	+	+
<i>Proteus species</i>	-	+	-	-	+	-

Key: +Indicates Presence-Indicates Absence

Table 3: Serological quality of chicks supplied to Maiduguri, north eastern Nigeria

Disease	Percentage of chicks positive for Antibodies (%)		
	Source		
	A	B	C
IBD	0	10	30
ND	44.4	30	75

Discussion

This study on broiler chick quality assessment carried out in Maiduguri, was done using both quantitative and qualitative chick quality assessment parameters. Tona *et al.* (2005) suggested that though there are still some unknown factors that can be involved in chick quality definition, quantitative (weight or length) and qualitative assessment of day-old chick quality are relevant and related to broiler performance. Objective definition of chick quality needs a combination of several factors such as embryonic and or day-old-chick physiological parameters, hatching weight, chick length, and chick physical aspects. As for qualitative aspects of chick quality, the incidences of day-old chicks with subnormal conditions in the navel area and those of hatchling activity are of significant importance in the growth of the chicks (Tona *et al.*, 2005).

Results from this study showed that chicks from source B had significantly ($P < 0.05$) higher body weight followed by source C and A. The body weight is the most widely used parameter for day-old chick quality assessment (Raghavan, 1999; Deeming, 2000; Boerjan, 2002; Decuypere *et al.*, 2002). Although reports are conflicting

about the relationship between day-old chick weight and broiler performance (Gardiner, 1973; Bray, 1983; Viera and Moran, 1999; Tona *et al.*, 2003), it is agreed that chick weights may be related to slaughter performance (Decuypere, 1979; Mcloughin and Gous, 1999 and Tona *et al.*, 2004). Similarly chicks from source B had higher chick length than the chicks from the other sources. Hill (2001) investigated the relationship between chick length and post-hatch growth, he demonstrated that increasing age of breeders leads to an increase of chick length and that single stage incubation system improves uniformity of day-old chicks lengths.

Tona (2003) and Tona *et al.* (2005) established the correlations between several of the qualitative parameters that have been included in determining chick quality. Interestingly, most parameters are highly correlated with the conditions of the navel area, amount of retracted yolk and chick activity indicating that these parameters alone may be sufficient for sorting day-old chicks into quality groups. These authors showed that the incidence of day-old chicks with subnormal conditions in the navel area was the highest indicating that this may be a parameter of significant importance in the growth of the chicks. Also, other subnormal conditions that contributed highly to the number of chicks with subnormal conditions included the amount of retracted yolk, remaining membrane, activity, downs and appearance. Using the scores from these parameters for determining chick quality proved to be a more reliable measure for predicting broiler performance. The chicks from source B proved to be of better quality in this regard as they showed better agility and all chicks in the group had their navels completely closed.

Four different bacterial organisms (*Proteus spp.*, *Streptococcus spp.*, *Staphylococcus spp.* and *Escherichia coli*) were found from the result of microbiological assessment. *Streptococci spp.* are normal intestinal tract flora could become pathogenic when the birds are subjected to stressful conditions such as poor environmental conditions leading to conditions such as omphalitis (Jordan and Pattison, 1996). *Proteus spp.* have been reported to cause yolk sac infection either on its own or more commonly together with *Escherichia coli* (Jordan and Pattison, 1996). *E. coli* and *Staphylococcus spp.* were the only bacteria isolated from the navel and cloaca of chicks from source B as compared to source C and A where almost all the bacteria isolated were found. Chicks from source C had better serological quality followed by source B and source A. Since the level of maternal antibodies in day-old broiler chicks is directly related to antibodies level in parent stock (Alexander, 1988). The poor presences of antibodies seen in the chicks suggest that antibodies level in parent stock is low and this does not protect the birds against field challenges.

In conclusion, Source B was found to supply day-old-chicks of better quality to Maiduguri. Minimum standards

for physical, microbiological and serological qualities of day-old chicks should be set for hatcheries in Nigeria. A regulatory body should also be established to ensure strict adherence to the minimum standards of the quality of day-old-chicks supplied to farmers.

References

- Adesimi, A.A. and B. Awoyomi, 1989. Potentials of poultry insurance as a risk management technique for Nigerian farmers. *Ife J. Agri.*, 11: 76-84.
- Aihonsu, J.O.Y. and M.A. Sunmola, 1999. Optimal laying period for profitable and sustainable egg production. *Ife J. Agri.*, 20: 67-80.
- Alexander, D.J., 1988. Newcastle disease diagnosis In: Alexander D.J. editor, Newcastle disease, Kluwer Academic Publishers, Boston, USA, pp:147-160.
- Alimi, T., 2001. Economic rational of integration in poultry production system. *Lesotho Soc. Sci. Rev.*, 7: 138-156.
- Alimi, T., S.O. Oluwasola and A.O. Adejobi, 2006. Optimal farm size for achieving enterprise objective and sustainability in poultry meat production in Osun State, Nigeria. *World's Poult. Sci. J.*, 62: 525-536.
- Allan, W.H. and R.E. Gough, 1974. A standard haemagglutination inhibition test for Newcastle disease- A comparison of macro and micro methods. *Vet. Rec.*, 95:120-123.
- Bamire, A.S. and A.B. Ayanwale, 1995. Costs and returns in alternative poultry keeping systems in Southern Nigeria: A comparative analysis. *Ind. J. Econ. LXXVI.*, 47-60.
- Boerjan, M., 2002. Programs for single stage incubation and chick quality. *Avian Poult. Biol. Rev.*, 13: 237-238.
- Borzemska, W.A., H. Malec, J. NiedzioÅlka, M. Lix and I. Pijarska, 1998. Evaluation of hen hatch in incubators with different synchronization of incubation time. *Rocz. Nauk. Zoot. T.*, 25: 223-229.
- Bray, T., 1983. Broiler chick weight-Does it matter? Gleadthorpe Exp. *Husb.Farm. Poult. Booklet*, 11: 17-20.
- Cullen, G.A. and P.J. Wyeth, 1975. Quantitation of antibodies to infectious bursal disease. *Vet. Rec.*, 97: 315.
- Decuypere, E., 1979. Effect of incubation temperature patterns on morphological, physiological and reproduction criteria in Rhode Island Red birds. *Agric.*, 27: 216-230.
- Decuypere, E. and H. Michels, 1992. Incubation temperature as a management tool: A review. *World's Poult. Sci. J.*, 48: 28-38.
- Decuypere, E., K. Tona, F. Bamelis, C. Careghi, B. Kemps, B. De Ketelaere, J. De Baerdemaker and V. Bruggeman, 2002. Broiler breeders and egg factors interacting with incubation conditions for optimal hatchability and chick quality. *Arch. Ge^uEgelkunde (Spec. Iss.)* 66: 56-57.
- Deeming, D.C., 2000. What is chick quality? *World Poult.*, 11: 34-35.
- Gardiner, E.E., 1973. Effects of egg weight on post hatching growth rate of broiler chicks. *Can. J. Anim. Sci.*, 53: 665-668.
- Geidam, Y.A, M.M. Bukar and A.G. Ambali, 2006. Chick quality control: A key to a sustainable poultry production in Nigeria. *Nig. Vet. J.*, 27: 1-6.
- GraphPad InStat, 1998. GraphPad InStat version 3.00 for Windows 95, GraphPad Software, San Diego California USA, www.graphpad.com". Copyright 1992-1998 GraphPad Software Inc. (www.graphpad.com)
- Hill, D., 2001. Chick length uniformity profiles as a field measurement of chick quality. *Avian Poult. Biol. Rev.*, 12: 188.
- Ibrahim, U.I., A.W. Mbaya, Y.A. Geidam, and A.M. Geidam, 2006. Endoparasites and associated worm burden of captive and free-living ostriches (*Struthio camelus*) in the semi-arid region of North eastern Nigeria. *Int. J. Poult. Sci.*, 5 : 1128-1132.
- Jordan, F.T.W. and M. Pattison, 1996. *Poultry Diseases*. 4th Edition. Saunders, pp: 42-147.
- Mcloughin, L. and R.M. Gous, 1999. The effect of egg size on pre-and post-natal growth of broiler chickens. *World Poult.*, 15: 3438.
- Raghavan, V., 1999. Give day-old chicks the best start. *World Poult.*, 15: 28-29.
- Tona, K., 2003. Effects of age of broiler breeders, incubating egg storage duration and turning duration during incubation on embryo physiology and broiler production parameters. Ph. D. thesis, K.U. Leuven, Belgium.
- Tona, K., F. Bamelis, B. De Ketelaere, V. Bruggeman, V.M.B. Moraes, J. Buyse, O. Onagbesan and E. Decuypere, 2003. Effects of Egg Storage Time on Spread of Hatch, chick quality and Chick Juvenile Growth. *Poult. Sci.*, 82: 736-741.
- Tona, K., O. Onagbesan, B. De Ketelaere, E. Decuypere, and V. Bruggeman, 2004. Effects of Age of Broiler Breeders and Egg Storage on Egg quality, Hatchability, chick quality, chick Weight and chick Post-Hatch Growth to 42 Days. *J. Appl. Poult. Res.*, 13: 10-18.
- Tona, K., V. Bruggeman, O. Onagbesan, F. Bamelis, M. Gbeassor, K. Mertens and E. Decuypere, 2005. Day-old-chick quality: relationship to hatching egg quality, adequate incubation practice and prediction of broiler performance. *Avian Poult. Biol. Rev.*, 16: 109-119.
- Viera, S.L. and E. T. Moran, 1999. Effects of eggs of origin and chick post hatch nutrition on broiler live performance and meat yields. *Worlds poult. Sci. J.*, 56: 125-142.